are conveyed via screw 3, while still at atmospheric pressure. While still at atmospheric pressure, the chips are compressed in screw device 4. Throughout the processing of the chips in components 2, 3 and 4, the material not only remains at atmospheric pressure, but the temperature thereof cannot exceed 100 deg. C. Moreover, it should be appreciated that an atmospheric system such as this cannot be operated in a casual manner to develop an overpressure, inasmuch as this would violate safety and code requirements so that a system designed for atmospheric pressure must remain at atmospheric pressure. Device 4 forms a plug at the discharge, thereby providing a pressure barrier against the higher pressures associated with the bin 6, feeding device 7, and refiner 8, all of which are operated with overpressure corresponding to a temperature range of 130-200 deg. C.

Thus, Cederquist discloses a system having atmospheric pre-steaming at zero psig and temperature not exceeding 100 deg.; conditioning at zero psig and a temperature not exceeding 100 deg. C, followed by compression at zero psig and a temperature not exceeding 100 deg. C, followed by preheating in an environment of saturated steam at a super-atmospheric pressure corresponding to 130-200 deg. saturated steam, followed by refining at super-atmospheric pressure corresponding to a temperature in the range of 130-200 deg. C. Applicant notes that the system of Cederquist is designed for MDF fiberboard in which discoloration is of no consequence, rather than for paper, where discoloration is of great consequence.

In contrast, applicant has amended each of the claims to unambiguously indicate that the specified pressure for the pretreatment is psig, therefore requiring significant overpressure relative to atmospheric, and further that the temperature of the material during the conditioning and compressing, is above 100 deg. C, which also requires super atmospheric conditions..

The inventor, who is a prolific author, assured the examiner during the interview that in the field of pulp and paper technology, all references to pressure in connection with operation of a plant, are understood by everyone working in this field, as referring to gauge pressure. This is because all instrumentation in plants are calibrated to show gauge pressure. For this reason, it was not deemed necessary to specifically identify in the specification, that the pressures were gauge pressures.

As a convenience for the examiner to compare each of applicant's independent claims with the disclosure of Cederquist, applicant refers to the attached Exhibit 2. The feed material in each instance is ligno material, which includes wood chips. Although applicants do not specifically claim a pre-steaming step, corresponding to component 2 in the Cederquist drawing, applicant's invention could in many plants be used following a conventional pre-steaming at atmospheric pressure, wherein the material temperature rises up to 100 deg. C. According to applicant's invention as defined in claim 29, conditioning occurs at a pressure of 15-25 psig, followed by compression at a pressure of 15-25 psig, and a compression ratio exceeding 4:1. These are shown in components 3 and 6 of the attached Exhibit 3 (corresponding to Figure 1 of applicant's drawings). Applicant has referred throughout the specification, to the combination of conditioning and compression, as "pretreatment". This is distinguishable from the following step of preheating, which occurs in vessel 20 as indicated in Exhibit 3. This is followed by TMP refining as indicated at 32. Claim 29 focuses on the combination of pretreatment at a pressure in the range of about 15-25 psi, wherein the compression portion of the pretreatment occurs at a ratio of greater than 4:1.

Applicant's independent claim 31 specifies that the pretreatment of conditioning and compressing occurs at a pressure range of about 10-25 psi with a temperature above 100 deg. C,

and the separate preheating occurs at a pressure above the pressure at which the destructuring occurred in the compression step. This is followed by the final step of TMP refining, which also occurs at a pressure above the pressure at which the compression portion of the pretreatment was performed.

With respect to Exhibit 3, as implemented in one embodiment of a conventional TMP system, applicant's conditioning and compression occur in a substantially unitary pretreatment equipment 6 comprising a conditioning tube 3 and a variable speed screw press 9. The discharge material is conveyed at atmospheric pressure via equipment 13, for feeding via plug screw feeder 15 into the preheating equipment 20,22, which is in a typical TMP operation, in the range of 30-55 psig. The preheated material is delivered through steam separator 14 and ribbon feeder 30 to the refiner 32 which also operates at the same pressure as the preheater, i.e., 30-55 psi.

Applicant's independent claim 36 is similar to claim 31 with respect to the pretreatment (conditioning and compression at a pressure in the range of about 10-25 psig and temperature above 100 deg. C), but is different in requiring that the preheat occur at a temperature above T_g and a time of less than 30 seconds, followed by TMP refining at a temperature above T_g and a higher than conventional speed of disc rotation. This corresponds to applicant's RTS-TMP as represented for example in Exhibit 4 (corresponding to applicant's Figure 3). The conditioning portion of the pretreatment is performed at 10-25 psig in a variable speed conveyor 74, and the compression is also performed in an atmosphere having the same range of pressure. This highly compressed material is directly discharged into the preheater 20, which would typically be operating in the range of 75-95 psig, and likewise the preheated material would be fed into the refiner 32 for refining under the same conditions of 75-95 psi with higher than standard disc rotation speed.

Based on the foregoing, applicant believes that the claims now are both internally consistent and clearly distinguish from Cederquist. In further support of patentability, applicant refers the examiner to the technical paper entitled "Mill Scale Results on TMP Pulping of Southern Pine with Pressurized Chip Pretreatment", the principal author of which is the present inventor, Marc Sabourin. The technical paper was submitted by facsimile to the Examiner on November 14, 2000, and a copy is also enclosed herewith as Exhibit 5. This paper will be presented by Mr. Sabourin at the 87th Annual Pulp and Paper Association of Canada, Annual Section Technical Meeting in February and the paper is currently being compiled with other papers for distribution to the attendees.

Page 6 of the paper identifies references 4, 5 and 6 as prior papers authored by Mr. Sabourin, regarding laboratory or pilot plant studies demonstrating the improvements achieved with the compressive pretreatment according to the present invention. Exhibit 5 presents results of the invention as implemented in a full size, large papermill, operated by one of the largest paper manufacturers in the United States. Applicant has highlighted with vertical lines, those portions of the paper which are particularly pertinent. The paper presents the results of the pretreatment system in the mill starting in July 1999. Exhibit 5 includes as page 7, an annotated version of the system schematic embedded in column 1 on page 2 of the technical paper. This system is implemented in the RTS-TMP refining line at the mill.

The favorable conclusions are summarized on page 6 of the paper. These are based on the summary tables appearing on pages 8 and 9 of the paper. Applicant notes that the wood chip feed material properties can vary seasonally, and therefore one set of data represent so-called winterwood (Table IV), and the other represent summerwood (Table VI). As the text clearly demonstrates in the lower half of column 1 on page 3, the pressure designation of "psi", as related

to equivalent "bar", necessarily refers to psig, without need for explanation, because the reader would understand this to be the case. Tables IV and VI have been annotated to include the English unit pressure for the corresponding "bar" units, for ready reference. In Table IV, the "bypass" condition means that the pretreatment according to the present invention (i.e., conditioning and compression) was not performed at all. The column indicating zero psi refers to conditioning and compression at atmospheric conditions, i.e., such as shown in the Cederquist patent.

The results of implementing applicant's invention were not only favorable in a full size mill operated by one of the country's largest paper company, but the results were so noteworthy as to merit the presentation in a technical paper at a major pulp and paper conference.

For the foregoing reasons, applicant requests that all claims be allowed, and a Notice of Allowability be issued.

Respectfully submitted,

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Date: January 10, 2001
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